

What is claimed is:

1. A method for detecting high impedance faults in electrical power lines comprising:

providing a plurality of high impedance fault detection means each having an output;

independently detecting a high impedance fault condition in said electrical power lines using said plurality of high impedance fault detection means; and

determining a presence of a high impedance fault using a decision means, wherein said decision means determines a high impedance fault if any two or more of said independent outputs are indicative that an associated one of said plurality of high fault detection means has detected a high impedance fault condition.

2. The method of claim 1 wherein said plurality of high impedance fault detection means are at least three.

3. The method of claim 1 wherein said plurality of high impedance fault detection means are at least three and each provide a logical output having one state indicative that said associated one of said three detection means has detected a high impedance fault and said decision means is a decision logic and said method further comprises:

said decision means determining a high impedance fault if any two of said three logical outputs are in a state indicative of detecting a high impedance fault.

4. The method of claim 1 wherein said decision means is a decision logic and said method further comprises:

providing at least three high impedance fault detection means having a logical output which in one state is indicative that said associated one of said three detection means has detected a high impedance fault; and

said decision means determining a high impedance fault if at least two of said at least three logical

outputs are in said state indicative of detecting a high impedance fault.

5. A system for detecting high impedance faults in an electrical power system having an alternating current flowing therethrough comprising:

an electrical power supply;

one or more interconnected electrical power conductors; and

a composite high impedance fault detection system connected to said one or more electrical power conductors for detecting a high impedance fault when at least two of a plurality of individual high impedance fault detection systems each independently detect the occurrence of a high impedance fault on said electrical power conductors.

6. The system of claim 5, wherein said plurality of independent individual high impedance fault detection systems further comprise:

a wavelet based system having a first logical output for detecting a high impedance fault condition in said electrical power line;

a higher order statistics based system having a second logical output for detecting a high impedance fault condition in said electrical power line; and

a neural network based system having a third logical output for detecting a high impedance fault condition in said electrical power line,

said wavelet based system, said higher order statistics based system and said neural network based system each independently detecting the same high impedance fault condition in said electrical power lines.

7. The system of claim 6, wherein said composite high impedance fault detection system further comprises a decision logic for determining an occurrence of a high impedance fault, wherein said decision logic determines said high impedance fault presence if any two of said first logical output, said second logical output, and/or

said third logical output are in a state indicative of the detecting of a high impedance fault condition.

8. The system of claim 5, further comprising a sensing device coupled to one or more of said one or more electrical power conductors for sensing current flow on said conductors and a bandpass filter disposed between said one or more of said sensing device and said composite high impedance fault detection system.

9. The system of claim 5, further comprising one or more processors that receives and processes data indicative of current flow on said one or more electrical power conductors from said sensing device and logical outputs from each of said individual high impedance fault detection systems, and that determines a high impedance fault on said one or more electrical power conductors when any two of said individual high impedance fault detection systems each independently detect a high impedance fault.

10. An apparatus for detecting a high impedance fault in electrical power lines comprising:

a wavelet based system having a first logical output for detecting a high impedance fault condition in said electrical power lines;

a higher order statistics based system having a second logical output for detecting a high impedance fault condition in said electrical power lines; and

a neural network based system having a third logical output for detecting a high impedance fault condition in said electrical power lines,

said wavelet based system, said higher order statistics based system and said neural network based system each independently detecting the same high impedance fault condition in said electrical power lines.

11. An apparatus for detecting a high impedance fault in electrical power lines comprising:

a plurality of high impedance fault detection means

each having an output, each of said plurality of high impedance fault detection means independently detecting a high impedance fault condition on said electrical power lines; and

a decision means for determining a high impedance fault if any two or more of said independent outputs are indicative that an associated one of said plurality of high fault detection means has detected a high impedance fault condition.

12. A protective relay for electrical power distribution lines, comprising:

one or more computing devices, only one of said computing devices used for detecting both non-high impedance faults and high impedance faults in said electrical power distribution lines.

13. The protective relay of claim 12 wherein said only one of said computing devices detects a high impedance fault in said electrical power distribution lines by independently detecting a high impedance fault condition in said electrical power lines using a plurality of high impedance fault detection means and determines a presence of a high impedance fault using a decision means, wherein said decision means determines a high impedance fault if any two or more of said plurality of independent high impedance fault detection means have detected a high impedance fault condition.